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Copper Networks, Evolution to Fiber and IP Transition

Overview of Existing Network and the Evolution to Fiber

Hany Fahmy, Ph.D.
Assistant Vice President – Regulatory/Global Public Policy
External and Legislative Affairs

Purpose & Agenda

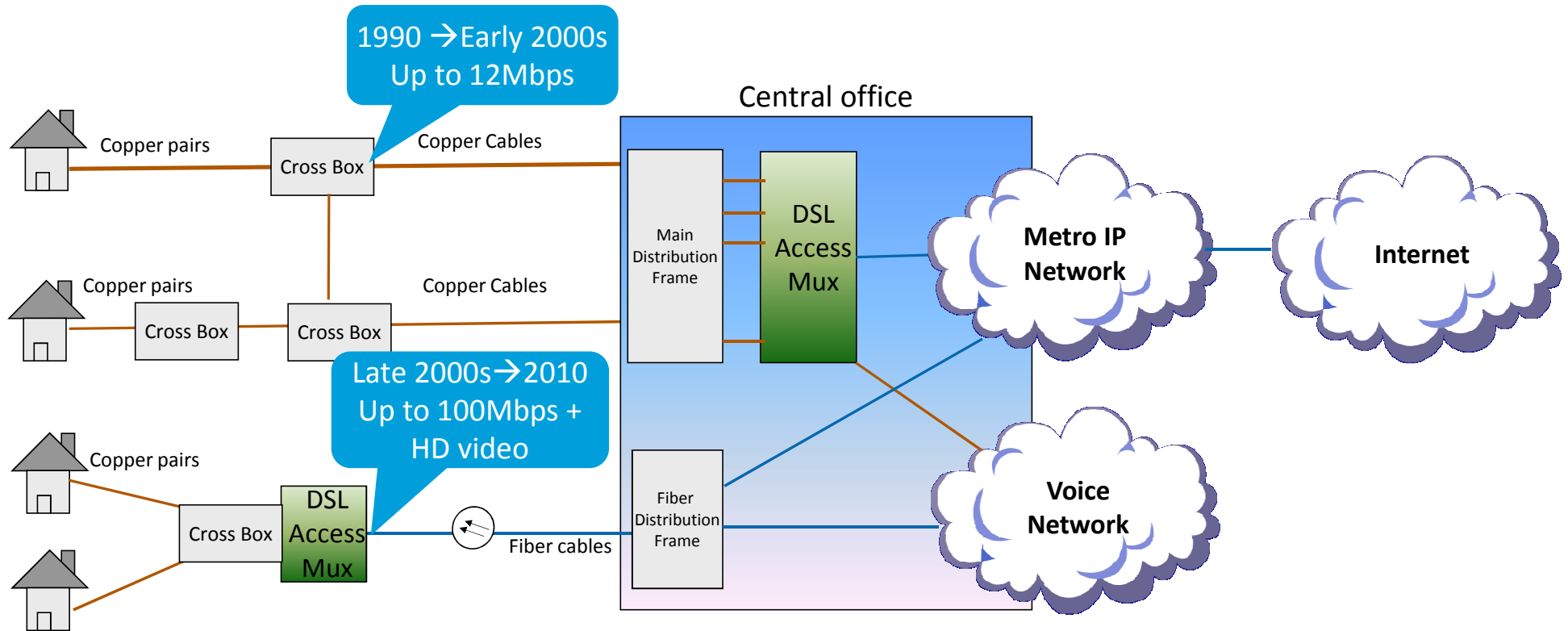
Provide an overview of the components of the Telecom network and the evolution from copper to fiber

- Copper Access and the Evolution of the AT&T Network
- Complexity of the Copper Network
- Copper Network Challenges
- The Evolution to Fiber
- Why Fiber?
- Industry Trends for POTS in the state of CA
- Summary

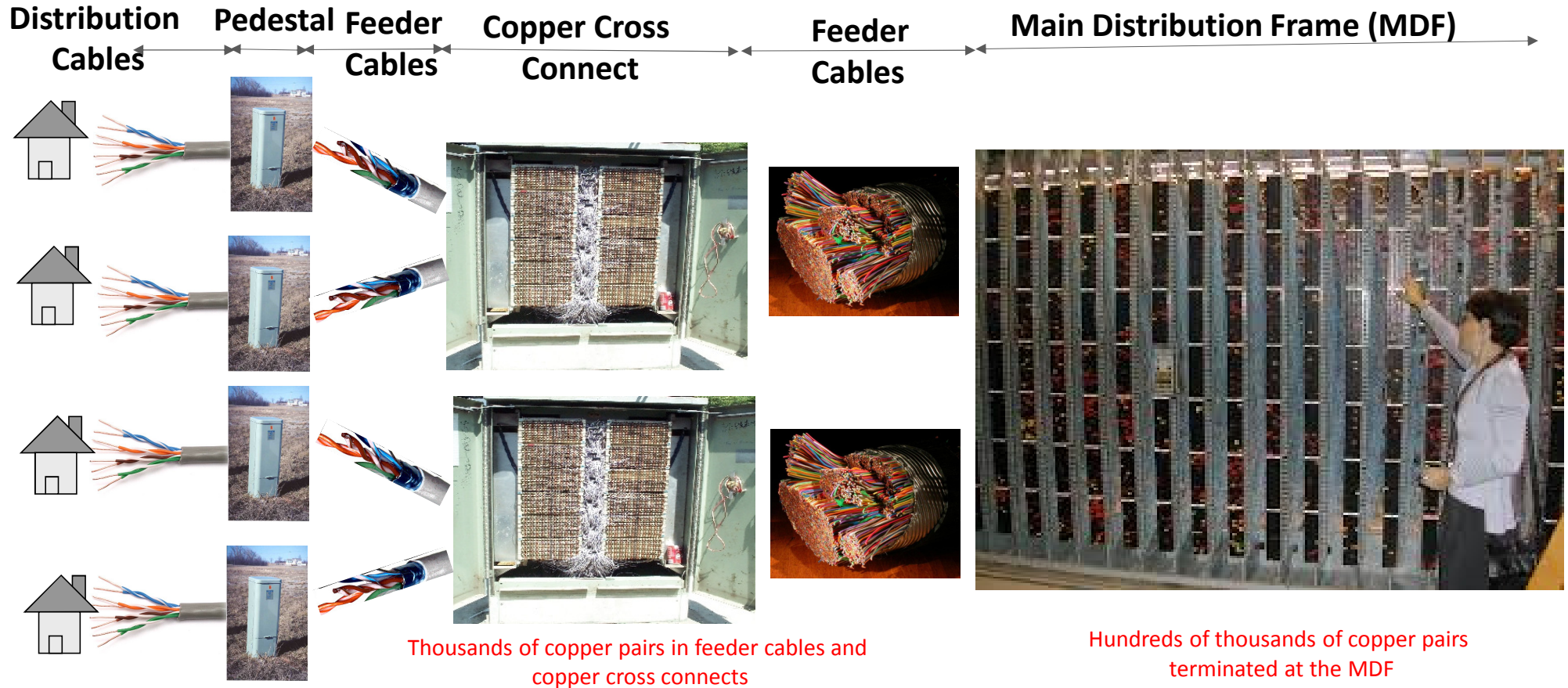
What happened in the last 20 years...



Copper Access and the Evolution of the Network

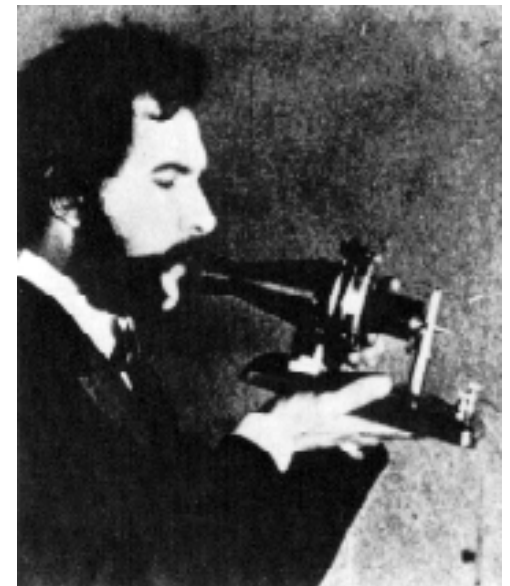


Complexity of Copper Network

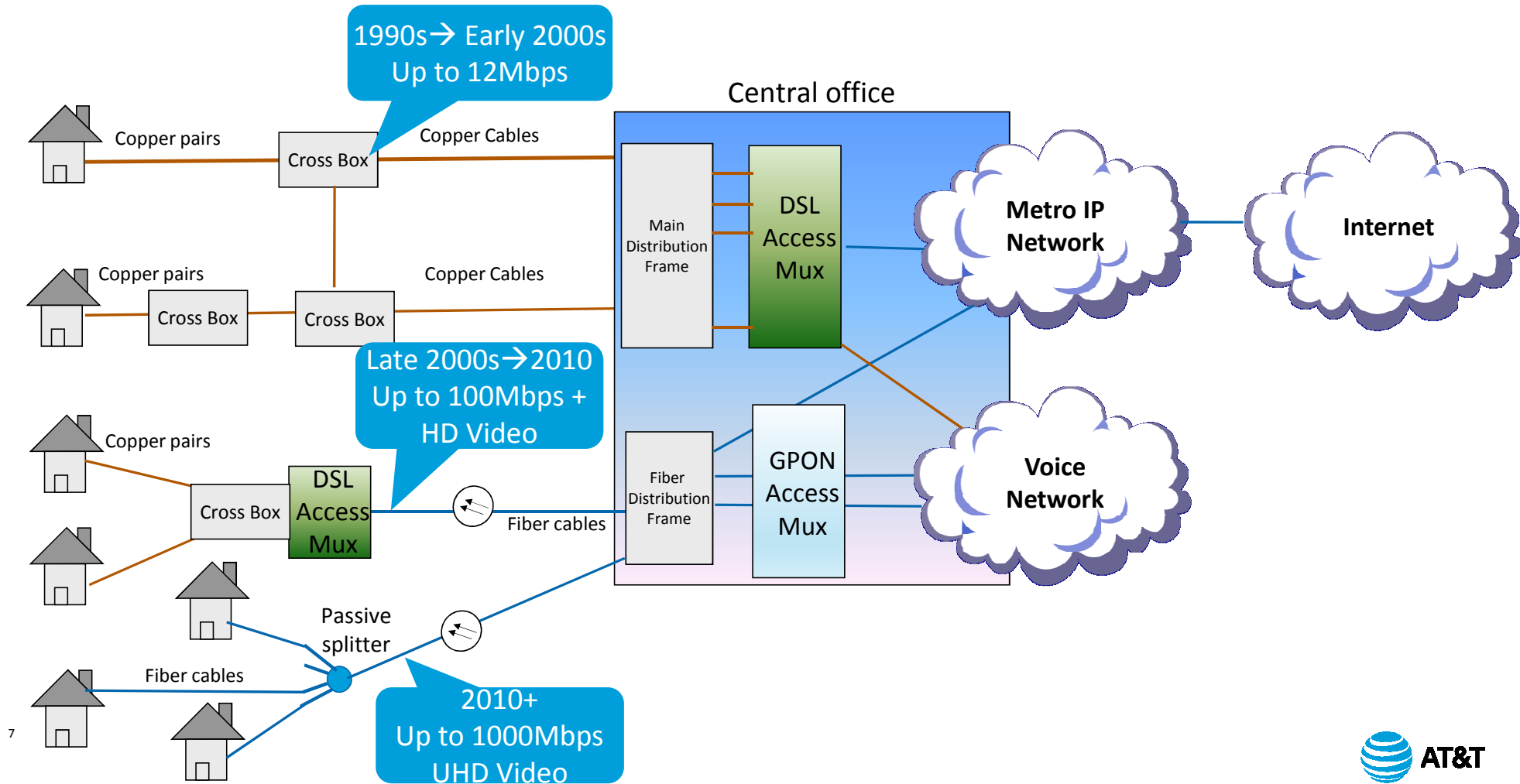


Copper Network Challenges

- Less robust service options, including lower broadband speeds
- Can't meet customer demand for new services, which require much higher bandwidth and broadband speed
- New technologies and cheaper components makes fiber more feasible
- Copper theft
- Very difficult to provision and maintain copper infrastructure

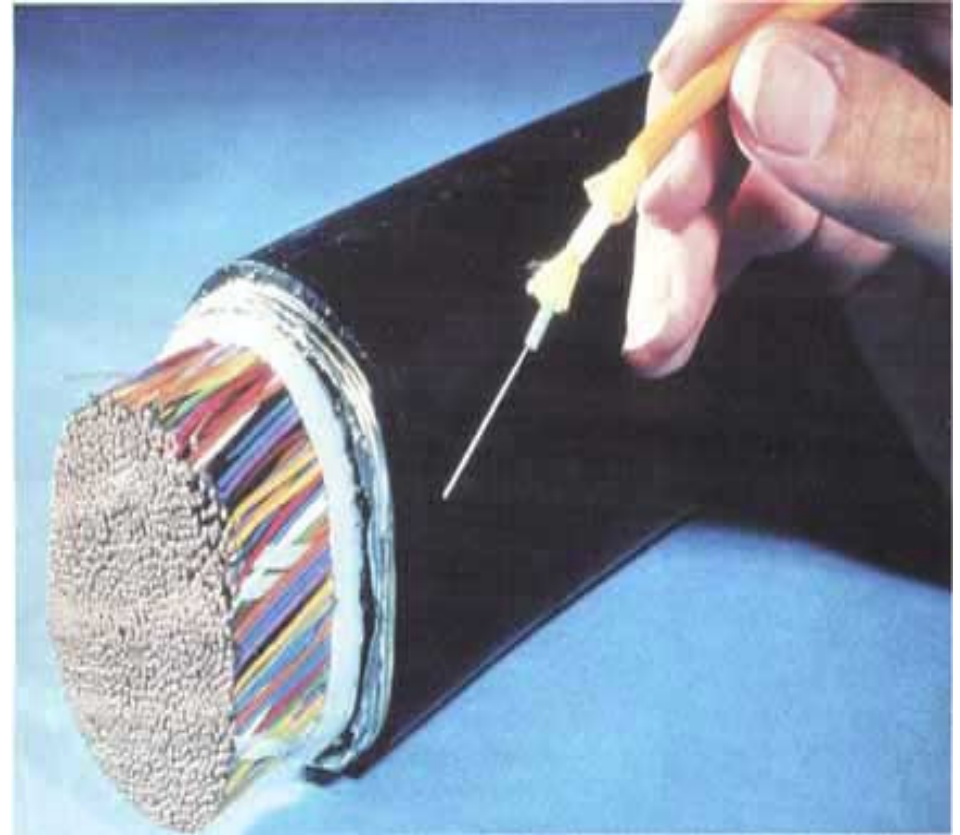


The Evolution to Fiber

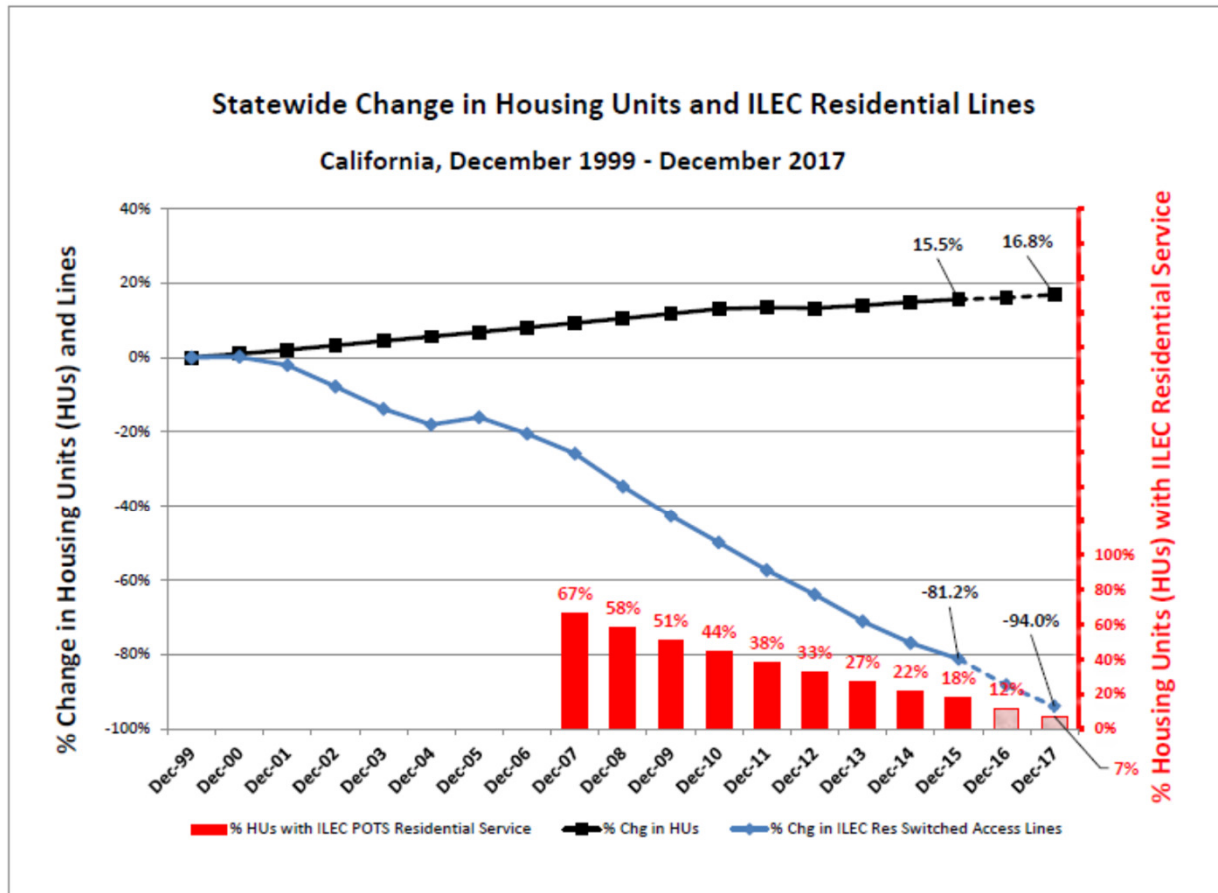


Why Fiber?

- Capacity of 2400 pair copper telephone cable:
 - 1 call per copper pair
- Capacity of a single fiber:
 - > 1,562,500 calls
- Size and weight
 - To transmit equivalent information 1 mile
 - Single fiber cable = 28 lbs
 - Equivalent capacity copper cable = 33 tons



Industry Trends for POTS in the State of CA



Data Source:

- ILEC Res Lines from FCC Voice Telephone Services Reports
- Housing Units are linear plots of values from 1990, 2000, 2010 Census plus ACS 2011 thru 2015 1 Yr Estimates
- Data for 2016 and 2017 are estimates using linear trending

Summary

- Evolution to fiber in many areas is required to keep up with customer demands for more robust service options, especially much higher speed broadband service
- This evolution started decades ago within the network core and over time has been pushed further out, however will continue to coexist with the copper infrastructure
- Fiber infrastructure supports the vast majority of services offered over copper today – including Residential Basic Service as defined by the CPUC; the CPUC's Basic Service definition is technology-neutral
- AT&T basic service provided over fiber supports analog devices (e.g., medical monitoring devices, alarm systems, etc.)
- AT&T uses existing customer notification processes to let customers know when facilities transitions take place. This may require a no-cost optical interface device upgrade at the customer's premise; underlying fiber facility upgrades have no effect on Residential Basic Service elements or pricing
- Battery backup options are available for VoIP and basic service provided over fiber + cell phones to call 911 in case of power outage
- Regulatory environment in CA should stimulate and encourage carriers to deploy fiber and next generation services so as to meet customer demands; otherwise, customers of the state will be left behind